

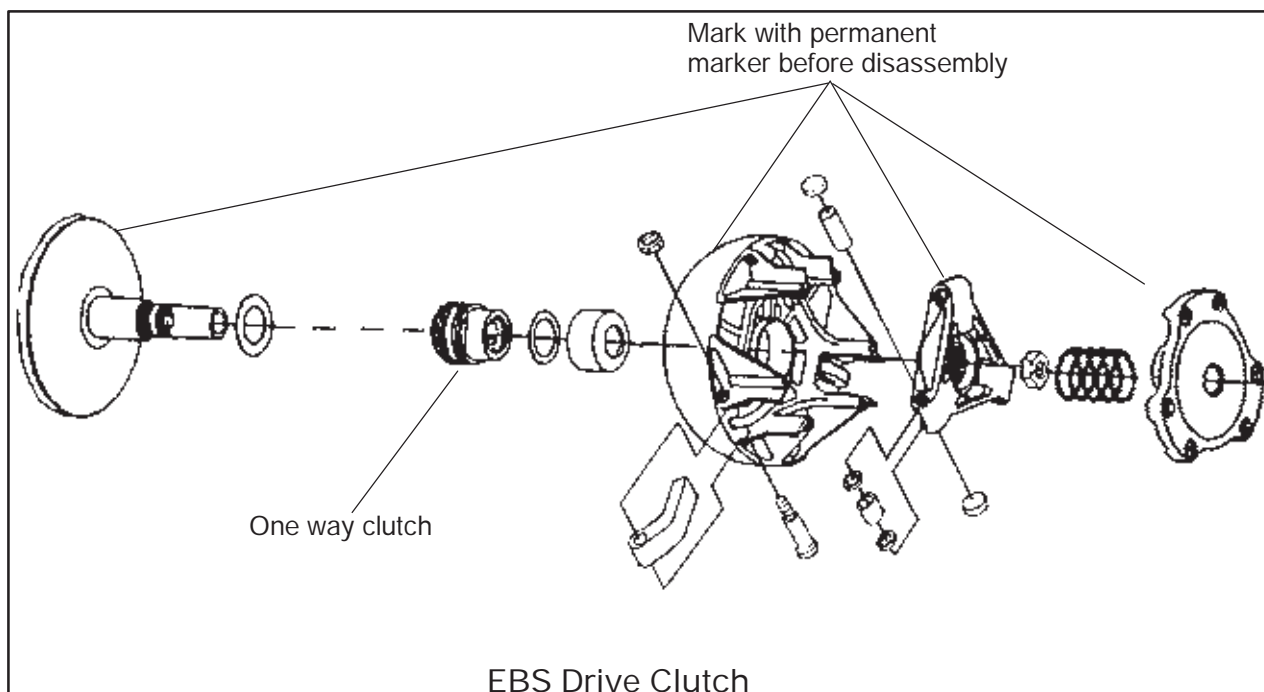
## **CHAPTER 6**

### **PVT SYSTEM**

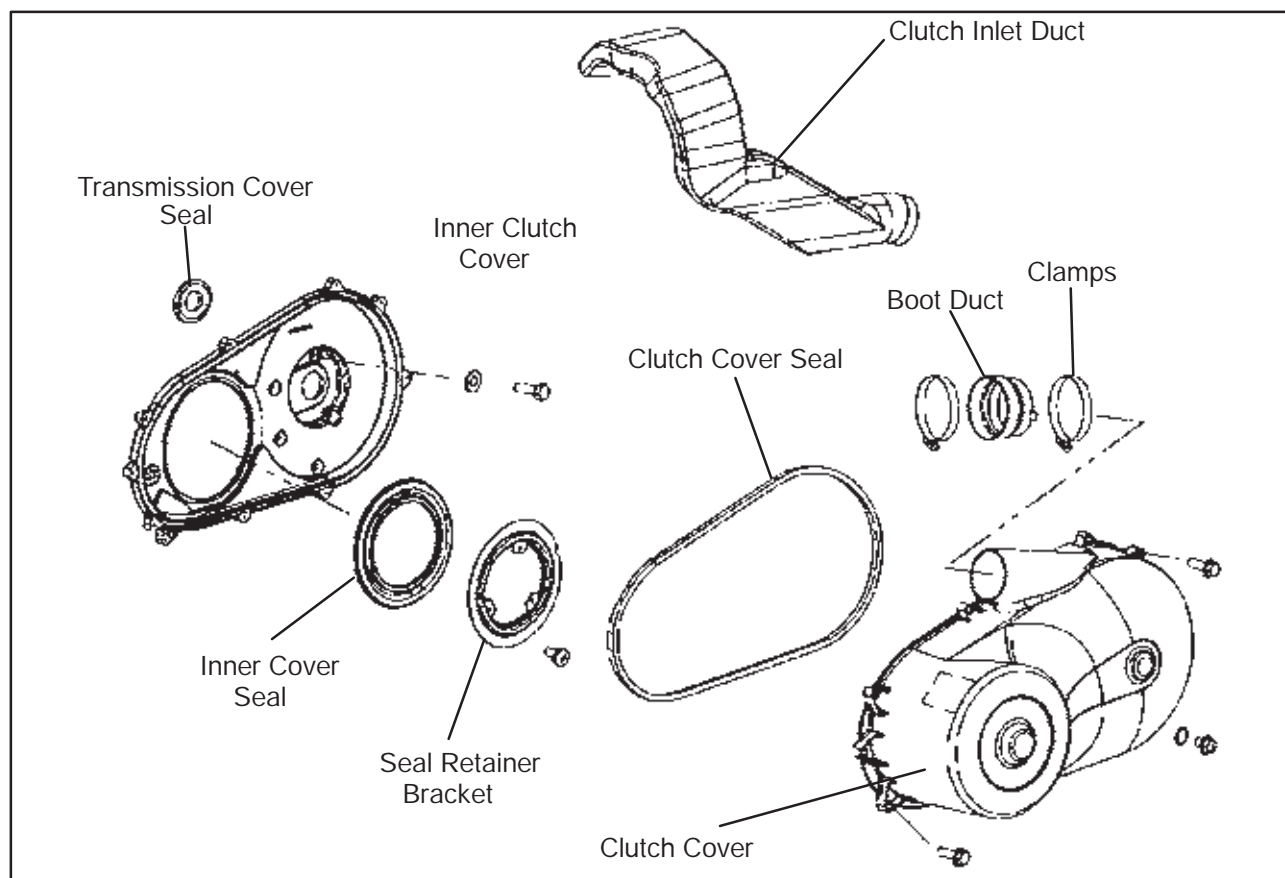
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## DRIVE CLUTCH EXPLODED VIEW

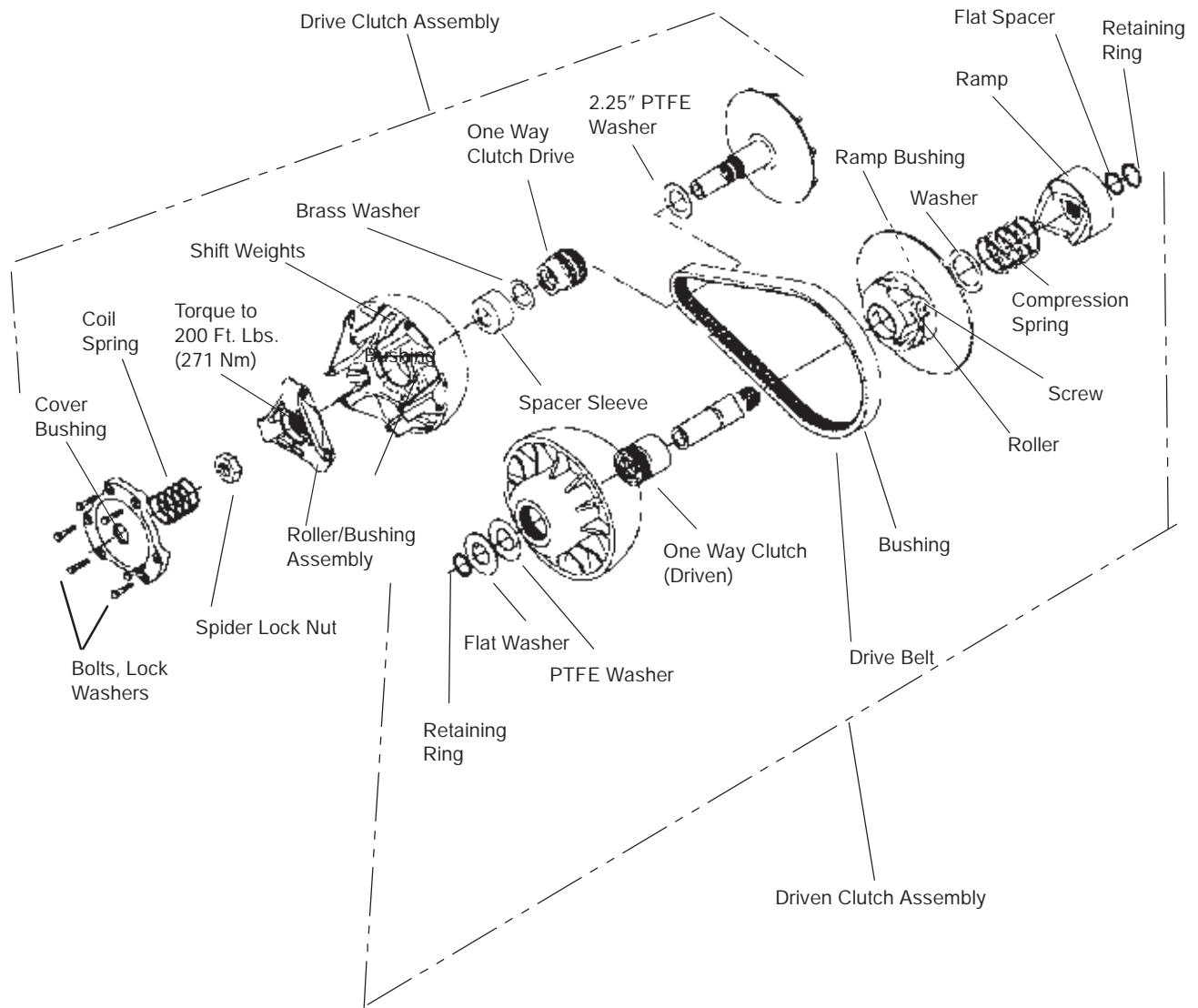


## PVT SEALING AND DUCTING COMPONENTS





## ENGINE BRAKING SYSTEM (EBS) EXPLODED VIEW





## SPECIAL SERVICE TOOLS AND SUPPLIES

| TOOL<br>DESCRIPTION                                | PART NUMBER |
|----------------------------------------------------|-------------|
| Clutch Puller                                      | 2870506     |
| Clutch Holding<br>Wrench                           | 9314177     |
| Clutch Holding<br>Fixture                          | 2871358     |
| Spider Nut Socket                                  | 2870338     |
| Drive Clutch<br>Spider Removal<br>and Install Tool | 2870341     |
| Driven Clutch<br>Puller                            | 2870913     |
| Roller Pin Tool                                    | 2870910     |
| Clutch Bushing<br>Replacement Tool<br>Kit          | 2871226     |
| Piston Pin Puller                                  | 2870386     |
| EBS Clutch<br>Alignment Tool                       | 2872292     |
| EBS Bushing<br>Replacement Kit                     | 2201379     |
| Clutch<br>Compression Tool                         | 8700220     |
| Clutch Bushing<br>Replacement Tool<br>Kit          | 2871025     |

| SPECIAL SUPPLIES             | PART NUMBER |
|------------------------------|-------------|
| Loctite™ 680 .....           | 2870584     |
| RTV Silicone Sealer .....    | 2870661     |
| Loctite Gasket Remover ..... | 2870601     |

## PVT SYSTEM FASTENER TORQUES

|                                          |                            |
|------------------------------------------|----------------------------|
| Drive Clutch Retaining Bolt ...          | 40 ft. lbs. (54 Nm)        |
| Driven Clutch Retaining Bolt ..          | 17 ft. lbs. (23 Nm)        |
| PVT Inner Cover Bolts .....              | 12 ft. lbs. (16 Nm)        |
| Drive Clutch Spider EBS Clutch) .....    | 200 ft. lbs.<br>(271 Nm)   |
| Drive Clutch Spider Lock Nut (Plastic) . | 15 ft. lbs. .<br>(20.3 Nm) |
| Drive Clutch Cover Plate .....           | 90 in. lbs. (10 Nm)        |

## PVT OPERATION OVERVIEW

### ⚠ WARNING



All PVT maintenance or repairs should be performed only by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual. Because of the critical nature and precision balance incorporated into the PVT components, it is absolutely essential that no disassembly or repair be made without factory authorized special tools and service procedures.

The Polaris Variable Transmission (PVT) consists of three major assemblies: 1) The Drive Clutch; 2) The Driven Clutch; and 3) The Drive Belt. The internal components of the drive clutch and driven clutch control engagement (initial vehicle movement), clutch upshift and backshift. During the development of a Polaris ATV, the PVT system is matched first to the engine power curve; then to average riding conditions and the vehicle's intended usage. Therefore, modifications or variations of components at random are never recommended. Proper clutch setup and careful inspection of existing components must be the primary objective when troubleshooting and tuning.

## DRIVE CLUTCH OPERATION

Drive clutches primarily sense engine RPM. The two major components which control its shifting function are the shift weights and the coil spring. Whenever engine RPM is increased, centrifugal force is created, causing the shift weights to push against rollers on the moveable sheave, which is held open by coil spring preload. When this force becomes higher than the preload in the spring, the outer sheave moves inward and contacts the drive belt. This motion pinches the drive belt between the spinning sheaves and causes it to rotate, which in turn rotates the driven clutch.

At lower RPM, the drive belt rotates low in the drive clutch sheaves. As engine RPM increases, centrifugal force causes the drive belt to be forced upward on drive clutch sheaves.

## DRIVEN CLUTCH OPERATION

Driven clutches primarily sense torque, opening and closing according to the forces applied to it from the drive belt and the transmission input shaft. If the torque resistance at the transmission input shaft is greater than the load from the drive belt, the drive belt is kept at the outer diameter of the driven clutch sheaves.





## DRIVEN CLUTCH OPERATION CONT'D

As engine RPM and horsepower increase, the load from the drive belt increases, resulting in the belt rotating *up* toward the outer diameter of the drive clutch sheaves and *downward* into the sheaves of the driven clutch. This action, which increases the driven clutch speed, is called *upshifting*.

Should the throttle setting remain the same and the vehicle is subjected to a heavier load, the drive belt rotates back *up* toward the outer diameter of the driven clutch and *downward* into the sheaves of the drive clutch. This action, which decreases the driven clutch speed, is called *backshifting*.

In situations where loads vary (such as uphill and downhill) and throttle settings are constant, the drive and driven clutches are continually shifting to maintain optimum engine RPM. At full throttle a perfectly matched PVT system should hold engine RPM at the peak of the power curve. This RPM should be maintained during clutch upshift and backshift. In this respect, the PVT system is similar to a power governor. Rather than vary throttle position, as a conventional governor does, the PVT system changes engine load requirements by either upshifting or backshifting.

## PVT MAINTENANCE/INSPECTION

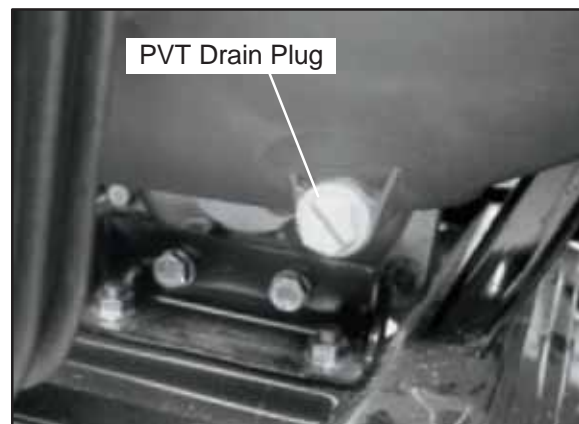
Under normal operation the PVT system will provide years of trouble free operation. Periodic inspection and maintenance is required to keep the system operating at peak performance. The following list of items should be inspected and maintained to ensure maximum performance and service life of PVT components. Refer to the troubleshooting checklist at the end of this chapter for more information.

1. Drive to Driven Clutch Offset, Belt Width. See Page-6.16-6.18
2. Drive and Driven Clutch Buttons and Bushings, Drive Clutch Shift Weights and Pins, Drive Clutch Spider Rollers and Roller Pins, Drive and Driven Clutch Springs. See Pages 6.11-6.12
3. Sheave Faces. Clean and inspect for wear.
4. PVT System Sealing. Refer to appropriate illustrations and photos. The PVT system is air cooled by fins on the drive clutch stationary sheave. The fins create a low pressure area in the crankcase casting, drawing air into the system through an intake duct. The opening for this intake duct is located at a high point on the vehicle (location varies by model). The intake duct draws fresh air through a vented cover. All connecting

air ducts, as well as the inner and outer covers, must be properly sealed to ensure clean air is being used for cooling the PVT system. This also will prevent water and other contaminants from entering the PVT area. A sealed PVT is especially critical on units subjected to frequent water forging.

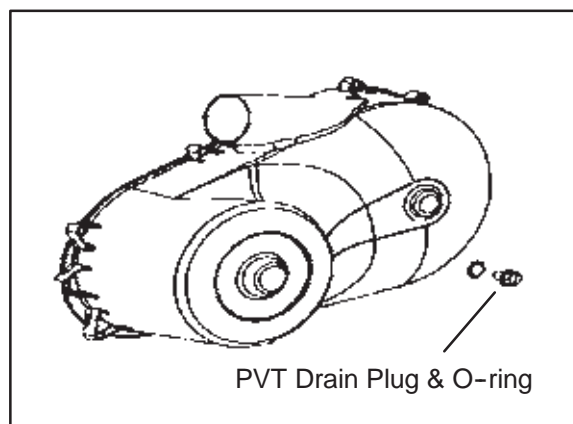
## PVT DRYING

**NOTE:** If operating the ATV through water, be sure to check the PVT cover and other ATV components for water ingestion. The ATV should be checked immediately. Refer to Owner's Manual for Safe Riding Tips.



To drain any water that may be trapped inside the PVT cover, simply remove the PVT drain plug and O-ring located on the bottom of the PVT cover and let the water drain out. The PVT drain plug is shown below.

To further expel water in the PVT cover and to dry out the PVT system, shift the transmission to neutral and rev engine slightly to expel the moisture. This will also air-dry the belt and clutches. Allow engine RPM to settle to idle speed, shift transmission to lowest available range and test for belt slippage. Repeat as needed. Operate ATV in lowest available range for a short period of time until PVT system is dry.





## PVT OVERHEATING/DIAGNOSIS

During routine maintenance or whenever PVT system overheating is evident, it's important to check the inlet *and* outlet ducting for obstructions. Obstructions to air flow through the ducts will significantly increase PVT system operating temperatures. The ATV should be operated in LOW RANGE when pulling or plowing heavy loads, or if extended low speed operation is anticipated.

|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GENERAL RANGE OPERATION GUIDELINES:                                | Low Range: Heavy pulling, basic operational speeds less than 7 MPH, riding through rough terrain (swamps, mountains, etc.), low ground speeds.                                                                                                                                                                                                                                                 |
|                                                                    | High Range: High ground speeds, speeds above 7 MPH.                                                                                                                                                                                                                                                                                                                                            |
| Diagnosis of Clutch Drive Belt & Cover Related Issues:             |                                                                                                                                                                                                                                                                                                                                                                                                |
| Possible Causes                                                    | Solutions/What to do                                                                                                                                                                                                                                                                                                                                                                           |
| Loading the ATV into a pickup or tall trailer when in high range.  | Shift transmission to low range during loading of the ATV to prevent belt burning.                                                                                                                                                                                                                                                                                                             |
| Starting out going up a steep incline.                             | When starting out on an incline, use low range, or dismount the ATV after first applying the park brake and perform the "K" turn.                                                                                                                                                                                                                                                              |
| Driving at low RPM or low ground speed (at approximately 3-7 MPH). | Drive at higher speed or use Low Range. The use of Low Range is highly recommended for cooler PVT operating temperatures and longer component life.                                                                                                                                                                                                                                            |
| Insufficient warm-up of ATVs exposed to low ambient temperatures.  | Warm engine at least 5 min., then with transmission in neutral, advance throttle to approx. 1/8 throttle in short bursts, 5 to 7 times. The belt will become more flexible and prevent belt burning.                                                                                                                                                                                           |
| Slow and easy clutch engagement.                                   | Fast, effective use of the throttle for efficient engagement. Continuous operation at the point of engagement (initial vehicle movement) increases PVT temperatures and component wear.                                                                                                                                                                                                        |
| Towing/Pushing at low RPM/low ground speed.                        | Use Low Range only.                                                                                                                                                                                                                                                                                                                                                                            |
| Plowing snow, dirt, etc./utility use.                              | Use Low Range only.                                                                                                                                                                                                                                                                                                                                                                            |
| Stuck in mud or snow.                                              | Shift the transmission to Low Range, carefully use fast, aggressive throttle application to engage clutch. Warning: Excessive throttle may cause loss of control and vehicle overturn.                                                                                                                                                                                                         |
| Climbing over large objects from a stopped position.               | Shift the transmission to Low Range, carefully use fast, aggressive, throttle application to engage clutch. Warning: Excessive throttle may cause loss of control and vehicle overturn.                                                                                                                                                                                                        |
| Belt slippage from water or snow ingestion into the PVT system.    | Shift the transmission to neutral. Using the throttle, vary the engine rpm from idle to 3/4 throttle. Engage transmission in the lowest possible range and test for belt slippage Repeat several times as required. During this procedure, the throttle should not be held at the full position for more than 10 seconds. PVT seals should be inspected for damage if repeated leaking occurs. |
| Clutch malfunction.                                                | Inspection/repair of clutch components should be performed by a certified Polaris MSD technician.                                                                                                                                                                                                                                                                                              |







## PVT DISASSEMBLY

NOTE: Some fasteners and procedures will vary. Refer to the appropriate parts manual for proper fasteners and fastener placement.

1. Remove seat.
2. Remove or loosen rear cab fasteners as necessary to gain access to PVT outer cover.
3. Remove PVT air outlet duct hose.
4. Remove outer cover screws. Refer to Page 6.2.
5. Mark the drive belt direction of rotation and remove drive belt. See Page 6.16 for drive belt removal.
6. Remove drive clutch retaining bolt and remove drive clutch using puller.



Drive Clutch Puller (PN 2870506)

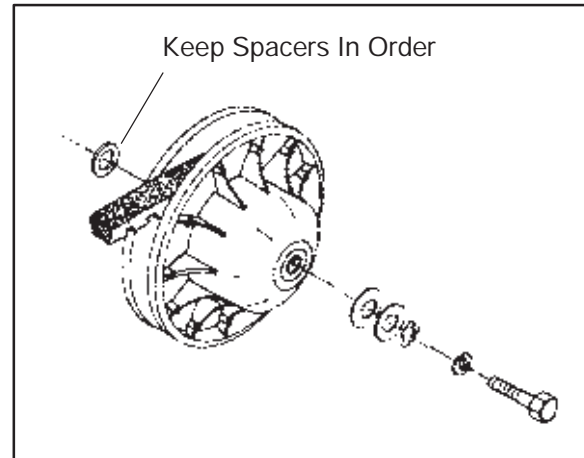
Clutch Holding Wrench (PN 9314177)

7. Remove driven clutch retaining bolt and driven clutch. Use puller if necessary.

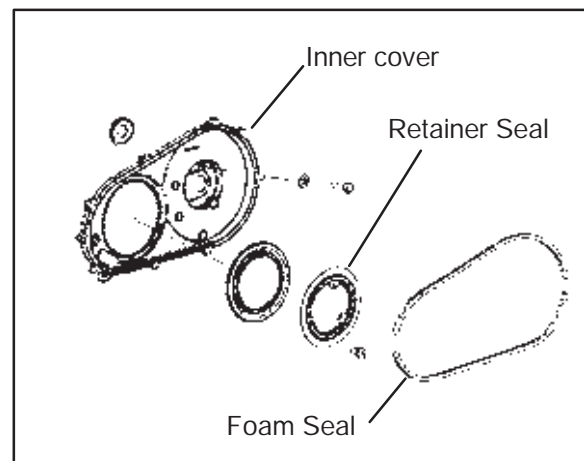


Driven Clutch Puller (PN 2870913)

8. Remove driven clutch offset spacers from the transmission input shaft. NOTE: Remember to keep spacers in order for proper clutch offset on reassembly.



9. Remove cover screws and retainer plate.



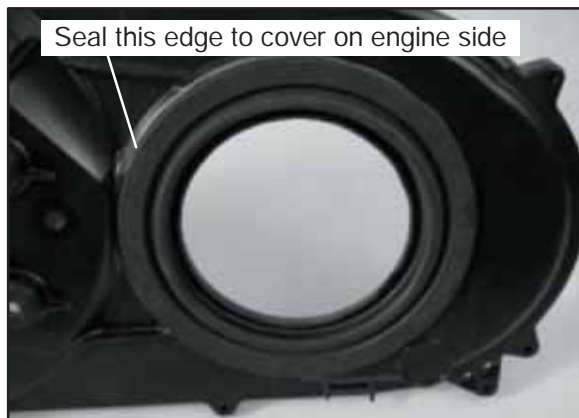
10. Remove inner cover retaining bolts at rear of cover.
11. Remove cover along with foam seal on back of cover or shaft.



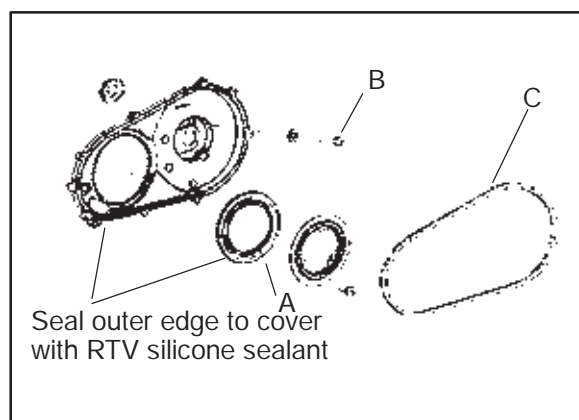


## PVT ASSEMBLY/INSPECTION

1. Inspect PVT inner cover-to-engine seal. Replace if cracked or damaged. Align the alignment mark on the cover with the mark on the engine seal.



2. Place a new seal on transmission input shaft.
3. Apply RTV silicone sealant to outside edge of inner cover-to-engine seal, to ensure a water tight fit between the seal and the cover on engine side. Surfaces must be clean to ensure adhesion of silicone sealant.
4. Reinstall cover and tighten rear cover bolts just enough to hold it in place.
5. Fit lip of inner cover seal (A) to engine. Install seal retainer plate and tighten screws securely.
6. Torque rear inner cover bolts (B) to specification.



Inner Cover Bolt Torque (Rear):  
12 ft. lbs. (16.6 Nm)

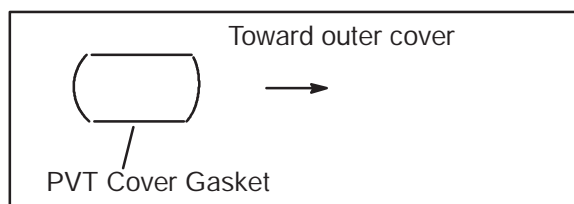
Driven Clutch Retaining Bolt Torque:  
17 ft. lbs. (23.5 Nm)

Drive Clutch Retaining Bolt Torque:  
40 ft. lbs. (55 Nm)

7. Install clutch offset spacer(s) on transmission input shaft.



8. Clean splines inside driven clutch and on the transmission input shaft.
9. Apply a light film of grease to the splines on the shaft.
10. Install the driven clutch, washer, lock washer, and retaining bolt. Torque to specification.
11. Clean end of taper on crankshaft and the taper bore inside drive clutch.
12. Install drive clutch and torque retaining bolt to specification.
13. Reinstall drive belt noting direction of rotation. If a new belt is installed, install so numbers can be easily read.
14. Only replace PVT outer cover rubber gasket if it is damaged. Place the gasket with the narrow side out (C).



15. Reinstall PVT outer cover and secure with screws.
16. Reinstall rear cab assembly, panel and seat.





## DRIVE CLUTCH SPRING SPECIFICATIONS

The drive clutch spring has two primary functions:

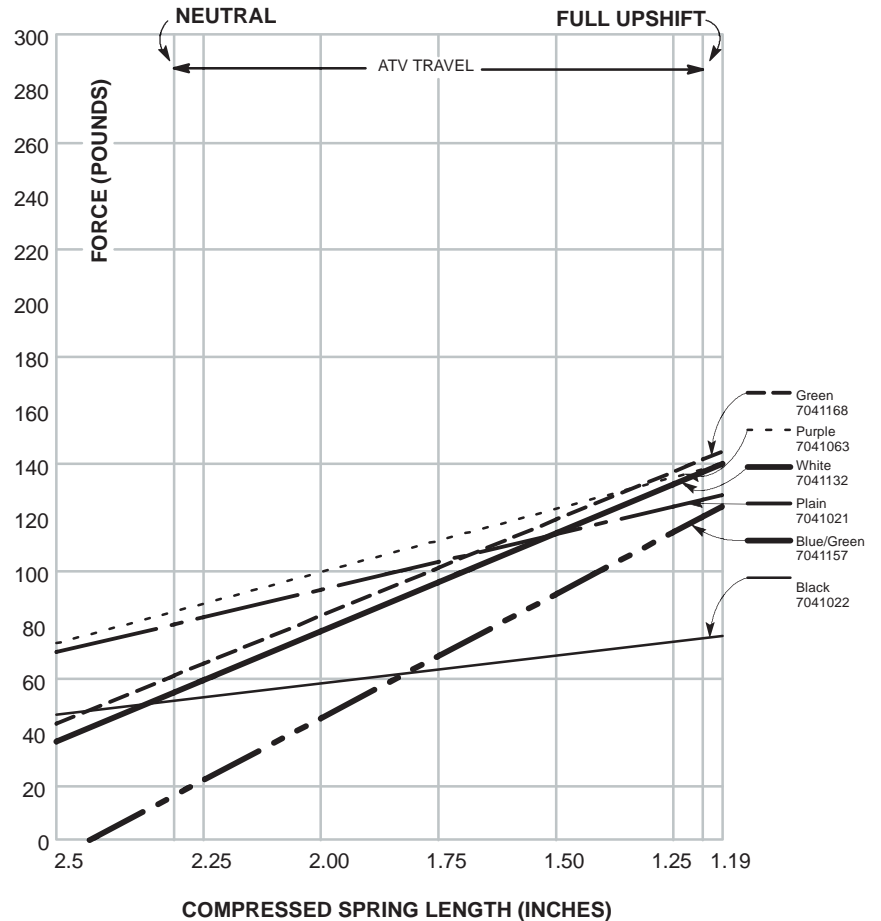
1. Controls clutch engagement RPM. The springs which have a higher rate when the clutch is in neutral will increase clutch engagement RPM.
2. Controls the rate at which the drive belt moves upward in the drive clutch sheaves. This is referred to as drive clutch upshift.

The drive clutch spring is one of the most critical components of the PVT system. It is also one of the easiest to service. Due to the severe stress the coil spring is subject to during operation, it should always be inspected for tolerance limits during any clutch diagnosis or repair.

There are other components which control upshift, but the spring is one of the primary components in insuring optimum performance. It is very important that the spring is of correct design and is in good condition.

**CAUTION:** Never shim a drive clutch spring to increase its compression rate. This may result in complete stacking of the coils and subsequent clutch component failure.

**Measuring Spring Length:** With the spring resting on a flat surface, measure its free length from the outer coil surfaces as shown. Refer to the spring specification chart for specific free length measurements and tolerances. Also check to see that spring coils are parallel to one another. Distortion of the spring indicates stress fatigue, requiring replacement.



### Primary Clutch Springs

| PART NUMBER | COLOR CODE | WIRE DIAMETER | FREE LENGTH $\pm .125"$ | PART NUMBER | DESCRIPTION  |
|-------------|------------|---------------|-------------------------|-------------|--------------|
| 7041021     | Plain      | .157"         | 4.38"                   | 7041198     | Red          |
| 7041022     | Black      | .140"         | 4.25"                   | 7041782     | Black 5-coil |
| 7041063     | Purple     | .168"         | 4.37"                   | 7041501     | Gold 6-coil  |
| 7041132     | White      | .177"         | 2.92"                   | 7041499     | Silver       |
| 7041168     | Green      | .177"         | 3.05"                   | 7041296     | Blue         |
| 7041157     | Blue/Green | .177"         | 2.53"                   | 7041646     | Silver/Blue  |

### Secondary Clutch Springs



## SHIFT WEIGHTS

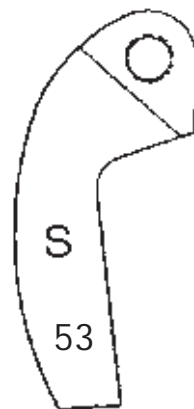
Shown below are optional shift weights which may be used in the PVT system. These shift weights have many different factors designed into them for controlling engagement RPM and shifting patterns. Shift weights should not be changed or altered without first having a thorough understanding the effects they have on belt to sheave clearance, clutch balance, engagement and shifting characteristics.



PN 5630418  
50 gr



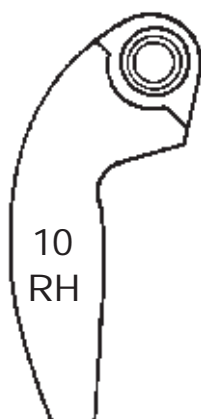
PN 5630279  
43 gr



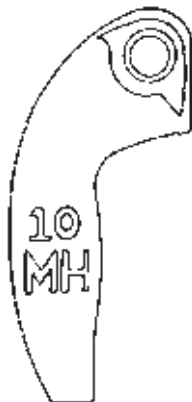
PN 5630095  
53 gr



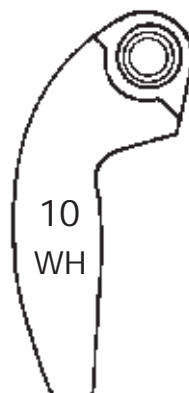
PN 5630509  
55 gr



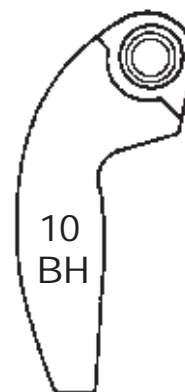
PN 5630709  
44 gr



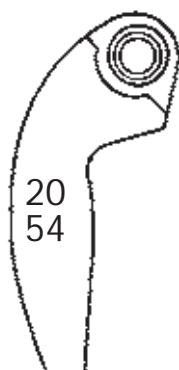
PN 5630513  
50.5 gr



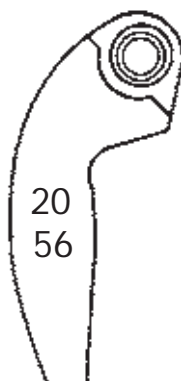
PN 5630710  
46 gr



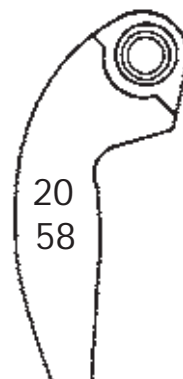
PN 5630711  
47gr



PN 5631214  
54 gr



PN 5631215  
56 gr



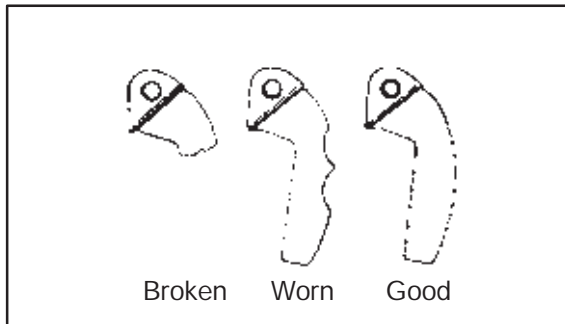
PN 5631216  
58 gr





## SHIFT WEIGHT INSPECTION

1. Inspect as shown, using a clutch holding tool to compress the moveable sheave. The contact surface of the weight should be smooth and free of dents or gall marks. Remove shift weight bolts and weights.



Inspect the weight pivot bore and pivot bolts for wear or galling. If weights or bolts are worn or broken, replace in sets of three with new bolts. NOTE: A damaged shift weight is usually caused by a damaged or stuck roller in the spider assembly. See roller inspection, Page 6.12.

### ⚠ WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly!

All PVT maintenance or repairs should be performed only by a certified Polaris Master Service Dealer (MSD) technician who has received the proper training and understands the procedures outlined in this manual. Because of the critical nature and precision balance incorporated into the PVT system, it is absolutely essential that no attempt at disassembly or repair be made without factory authorized special tools and service procedures.

## BUTTON TO TOWER CLEARANCE INSPECTION

1. Inspect for any clearance between spider button to tower. If clearance exists, replace all buttons and inspect surface of towers. See Spider Removal Page 6.12.

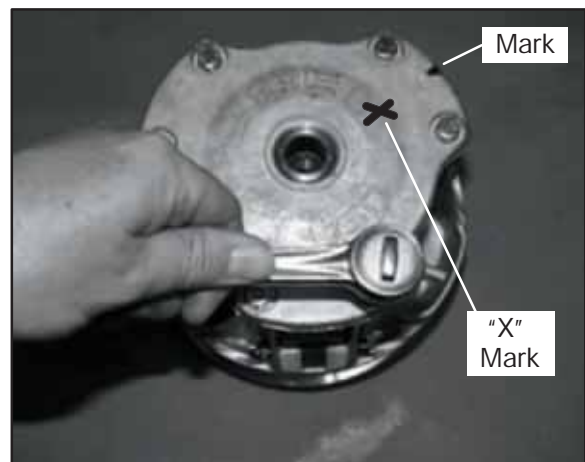


Button to Tower Clearance:  
.000 - .001"

2. Inspect sheave surfaces. Replace the *entire clutch as an assembly* if worn, damaged or cracked.

## DRIVE CLUTCH DISASSEMBLY

1. Using a permanent marker, mark the cover, spider, and moveable and stationary sheaves for reference, as the previous X's may not have been in alignment before disassembly.

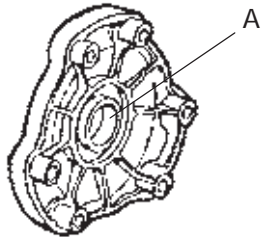




## DRIVE CLUTCH DISASSEMBLY CONT'D

2. Remove cover bolts evenly in a cross pattern and remove cover plate.
3. Inspect cover bushing (A). The outer cover bushing is manufactured with a Teflon™ coating. Wear is determined by the amount of Teflon™ remaining on the bushing.

Cover Bushing inspection



## Cover Bushing Inspection:

Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

4. Inspect area on shaft where bushing rides for wear, galling, nicks, or scratches. Replace clutch assembly if worn or damaged.
5. Remove and inspect spring. (See Page 6.9)

SPIDER REMOVAL

1. Remove the limiter nut using the Clutch Spider Nut Socket (PN 2870338). Install clutch in holding fixture and loosen the spider (counterclockwise) using Clutch Spider Install Tool (PN 2870341).

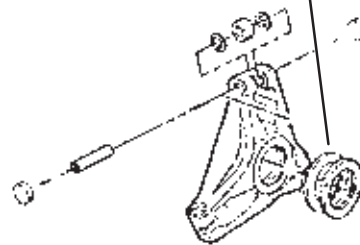


Clutch Holding Fixture:  
(PN 2871358)

Spider Removal Tool:  
(PN 2870341)

NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. Be sure to note the number and thickness of these washers.

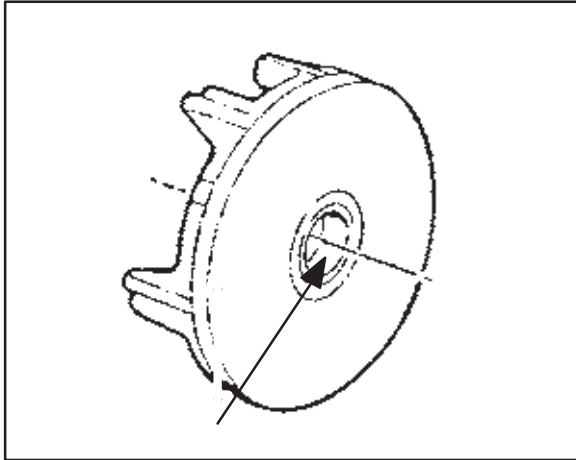
To maintain proper clutch balance and belt-to-sheave clearance, be sure to reinstall original quantity and thickness washers





### Moveable Sheave Bushing Inspection

2. Inspect the Teflon™ coating on the moveable sheave bushing.



#### Moveable Sheave Bushing Inspection:

Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

button is positioned toward the solid roller pin. It is recommended to switch all buttons to the rubber version during service (if needed).

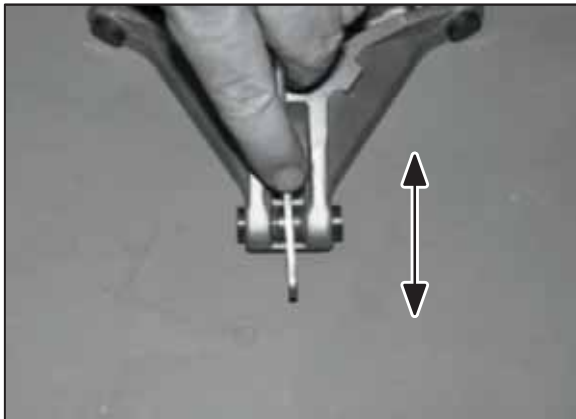


## DRIVE CLUTCH REASSEMBLY

NOTE: It is important that the same number and thickness of washers are reinstalled beneath the spider during assembly. The Teflon bushings are self-lubricating. Do not apply oil or grease to the bushings.

### Roller, Pin and Thrust Washer Inspection

3. Inspect all rollers, bushings and roller pins by pulling a flat metal rod across the roller. Turn roller with your finger. If you notice resistance, galling, or flat spots, replace rollers, pins and thrust washers in sets of three. Also inspect to see if roller and bushing are separating. Bushing must fit tightly in roller. Use the Roller Pin Tool (PN 2870910) to replace rollers and pins. Take care not to damage roller bushing or bearing surface of the new pin during installation.



4. Rubber backed buttons can and should be used in all ATV clutches *if the hollow roller pin is changed to a solid roller pin*. NOTE: The rubber side of the

1. Reassemble drive clutch in the following sequence. Be sure the "X", or the marks that were made earlier, are aligned during each phase of assembly.

- a) "X", or the marks that were made earlier on cover
- b) X on spider, making sure spacer washers are installed underneath spider and positioned properly in recess.
- c) "X", or the marks that were made earlier under weight



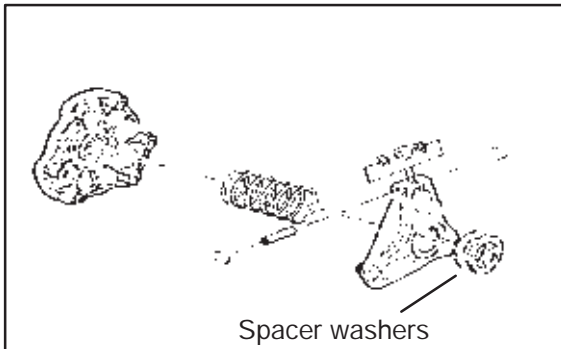


## DRIVE CLUTCH REASSEMBLY CONT'D

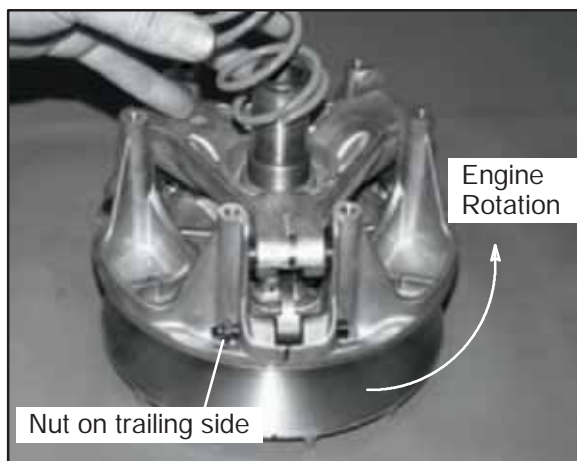
2. Install moveable sheave onto fixed sheave.
3. Install spider spacers. Use same quantity and thickness as were removed.
4. Compress spider buttons for each tower and install spider, making sure that "X", or the marks that were made earlier, on spider aligns with "X", or the marks that were made earlier on the moveable sheave.
5. Torque spider to specification using the holding fixture and spider tool. Torque with smooth motion to avoid damage to the stationary sheave. Refer to Page 6.3 for torque specification.

### CAUTION:

Be sure the spider spacer washers are fully seated in the recessed area of the spider. Any misalignment will alter clutch balance. Inverting the clutch while initially tightening the spider will help position the washers.



6. Install limiter nut on top of spider using the Clutch Spider Nut Socket (PN 2870338). Torque to 15 ft. lbs. Reinstall shift weights using new lock nuts on the bolts.
7. Reinstall clutch spring.



8. Reinstall cover, aligning "X" mark with other marks. Torque cover bolts evenly to specification.



Spider Torque:  
200 ft. lbs. (271 Nm)

Cover Screw Torque:  
90 in. lbs. (10.4 Nm)

## DRIVE BELT REMOVAL/INSPECTION

1. Remove outer PVT cover as described in PVT Disassembly.
2. Mark drive belt direction of rotation so that it can be installed in the same direction. NOTE: Normally positioned so part numbers are easily read.
3. To remove drive belt, apply brake, pull upward and rearward on belt to open driven clutch sheaves, pull out and down on belt to slip over the driven clutch outer sheave.

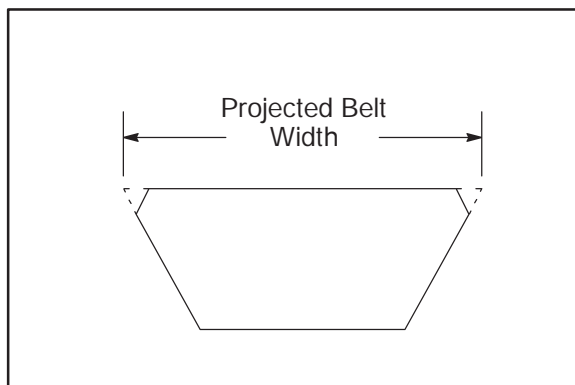






NOTE: When reinstalling the belt with the drive clutch and driven clutch already removed follow these steps:

- Install the driven clutch.
  - Install the belt onto the driven clutch.
  - Loop the drive clutch through the belt.
  - Install the drive clutch onto the crankshaft.
4. Measure belt width and replace if worn. Generally, belts should be replaced if clutches can no longer be adjusted to provide proper belt deflection.
- The top edges have been trimmed on some drive belts. It will be necessary to project the side profiles and measure from corner to corner.
  - Place a straight edge on each side of the drive belt.
  - Place another straight edge on top of belt.
  - Measure the distance where the side straight edges intersect the top, as shown in the illustration.

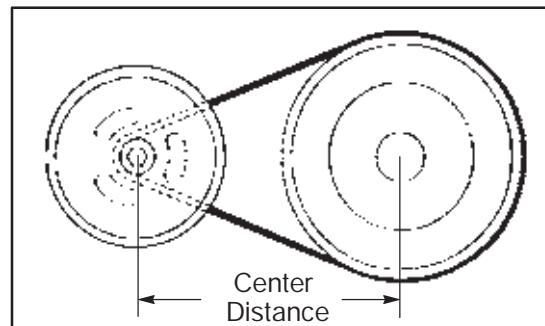


Belt Width:

New 1.174 - 1.188" (2.98-3.02 cm)

Wear Limit 1.125" (2.86 cm)

5. Inspect belt for loose cords, missing cogs, cracks, abrasions, thin spots, or excessive wear. Replace if necessary.
6. Inspect belt for hour glassing (extreme circular wear in at least one spot and on both sides of the belt). Hour glassing occurs when the drive train does not move and the drive clutch engages the belt continuously in one spot.
7. Measure belt length with a tape measure around the outer circumference of the belt. Belts which measure longer than nominal length may require driven shimming or engine adjustment for a longer center distance to obtain proper belt deflection. Belts which measure shorter than nominal length may require driven shimming or a shorter center distance. *Remember, proper belt deflection is the desired goal - not a specific center distance.*
8. Replace belt if worn past the service limit. Belts with thin spots, burn marks, etc., should be replaced to eliminate noise, vibration, or erratic PVT operation. See Troubleshooting Chart at the end of this chapter for possible causes.



Clutch Center Distance -  
10" +.1 / -.05 (254 +2.5 / -1.3mm)  
Belt Nominal Length - 40.875" ± 3/16  
(103.8 cm ± .48 cm)



## DRIVE BELT INSTALLATION

1. Loop belt over drive and over top of driven sheave.
2. While pushing down on top of belt, turn the back or moveable driven sheave clockwise.



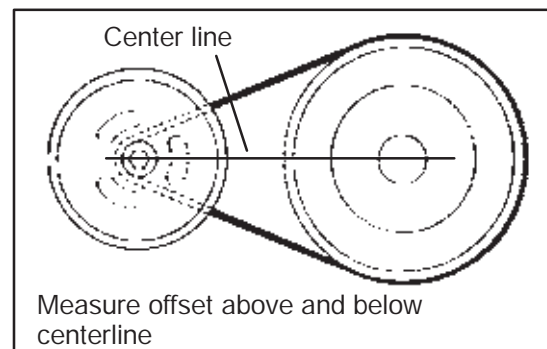
3. The belt then should be able to be pushed down into and between the sheaves.

NOTE: Be sure to position belt so part number is easily read.

2. With tool touching rear of driven clutch inner sheave, the distance at point "A" should be  $1/8"$ .

NOTE: If the distance is greater than  $1/8"$  or less than  $1/16"$ , clutch alignment must be adjusted as follows:

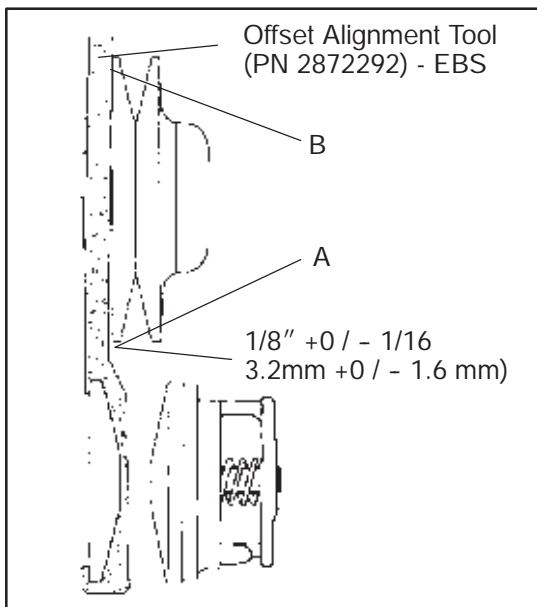
3. Remove drive and driven clutch. See PVT Disassembly, Pages 6.7-6.8.
4. Remove PVT inner cover.
5. Loosen all engine mounts. Move front of engine to the right or left slightly until alignment is correct.
6. Tighten engine mounts and verify alignment is correct.
7. Measure belt deflection and measure offset both above and below shaft centerlines. Adjust if necessary.



NOTE: On some models, minor adjustments can be made by adding shims between the frame and front lower left engine mount to increase the distance at point "A". If a shim is present, it can be removed to decrease the distance at point "A".

## CLUTCH ALIGNMENT

1. Remove belt and install the Clutch Offset Alignment Tool (PN 2872292) as shown.



Shim Kit (PN 2200126)

## CLUTCH OFFSET

Important: Inspect clutch alignment and center distance before adjusting offset.

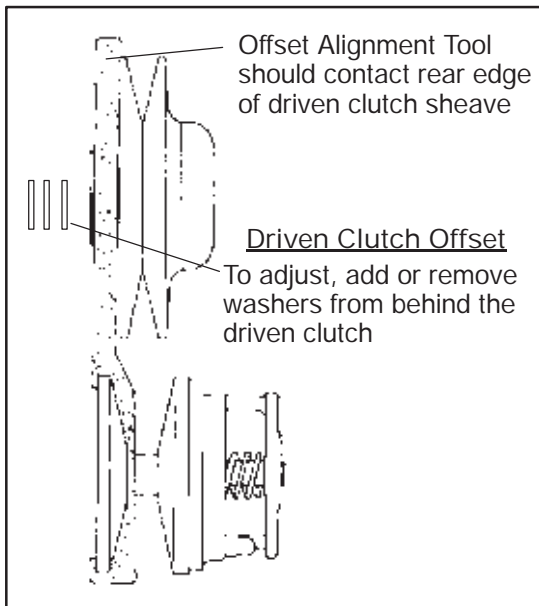
Offset is correct when rear of tool contacts rear of inner sheave with driven clutch pushed completely inward on shaft and bolt torqued. Adjust offset by adding or removing spacer washers between back of driven clutch and spacer.

Spacer Washer (PN 7556401)





1. Install offset alignment tool as shown. Remember to measure above and below the shaft centerlines.



## ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH)

1. Rotate one-way clutch clockwise (as viewed from the cover plate side). The clutch should rotate on the shaft with only slight amount of drag. Verify there is no binding or rough spots. When rotated counterclockwise, the clutch should lock to the shaft without slipping. If problems are noted in either direction, continue with disassembly.



## DRIVE CLUTCH INSPECTION

NOTE: Remove cover, spring, and spider following instructions for drive clutch removal, then proceed as follows:

1. Remove moveable sheave spacer sleeve and the brass washer. Visually inspect the washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.



Brass Washer Thickness  
Standard: .030" (.76mm)  
Service Limit: .025" (.64mm)

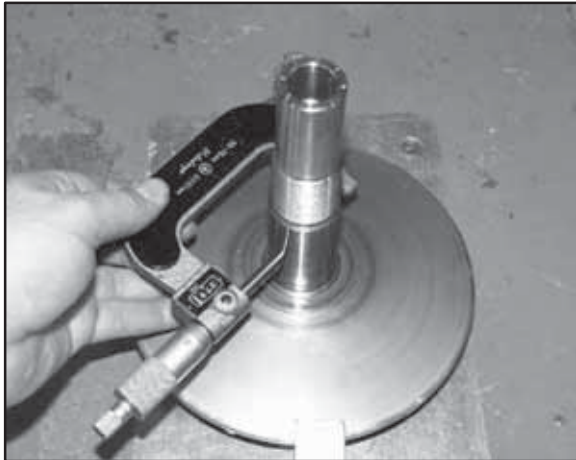
2. Lift one-way clutch off shaft. Replace as an assembly if worn, damaged, or if problems were noted.





## ONE-WAY CLUTCH INSPECTION (DRIVE CLUTCH) CONT'D

- Inspect surface of shaft for pitting, grooves, or damage. Measure the outside diameter and compare to specifications. Replace the drive clutch assembly if shaft is worn or damaged.



**Shaft Diameter**  
Standard: 1.3745" - 1.375"  
Service Limit: 1.3730"

- Remove 2 1/2" PTFE washer from shaft. Visually inspect the washer for damage. Measure the thickness and compare to specification. Replace if worn or damaged.

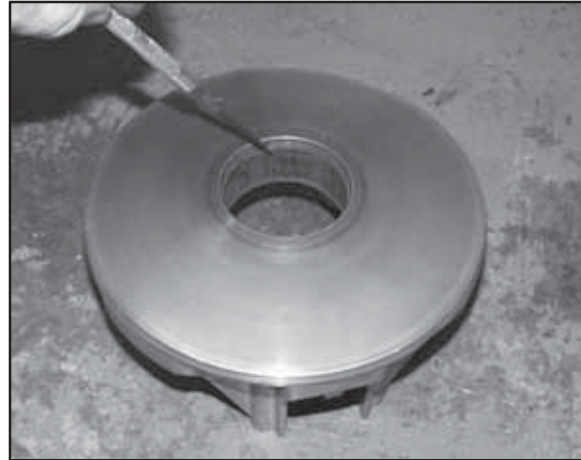
**PTFE Washer Thickness**  
Standard: .030" (.76mm)  
Service Limit: .025" (.64mm)

## MOVEABLE SHEAVE BUSHING INSPECTION

- Inspect the Teflon™ coating on the moveable sheave bushing. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed

### Moveable Sheave Bushing Inspection:

Replace the cover bushing if more brass than Teflon™ is visible on the bushing. Refer to bushing replacement in this chapter.

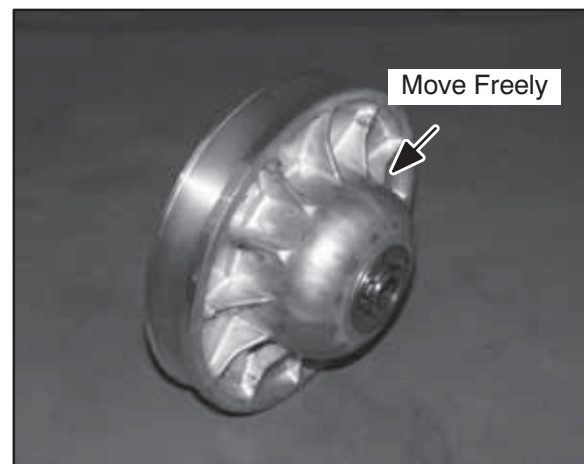


## EBS DRIVEN CLUTCH DISASSEMBLY/INSPECTION -

**CAUTION:** The driven clutch must be disassembled from the helix end to lessen the chance of damage to seals in the one-way clutch. Review all information below before proceeding.

## ONE-WAY CLUTCH PRELIMINARY INSPECTION (DRIVEN)

- With drive belt removed and transmission in gear, hold the inner sheave and rotate the outer sheave of the driven clutch in a counterclockwise direction as shown at right. The sheave should rotate with only a slight amount of drag. There should not be any binding or rough spots.



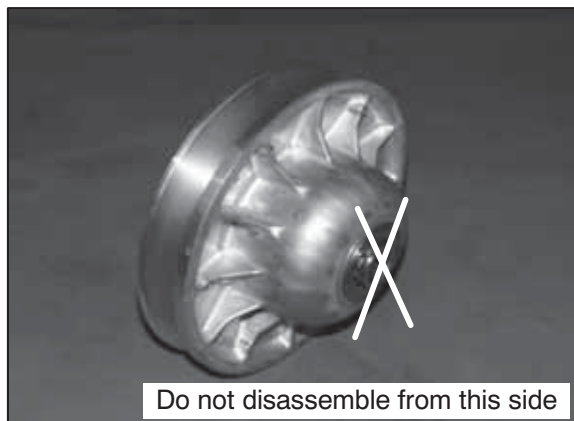




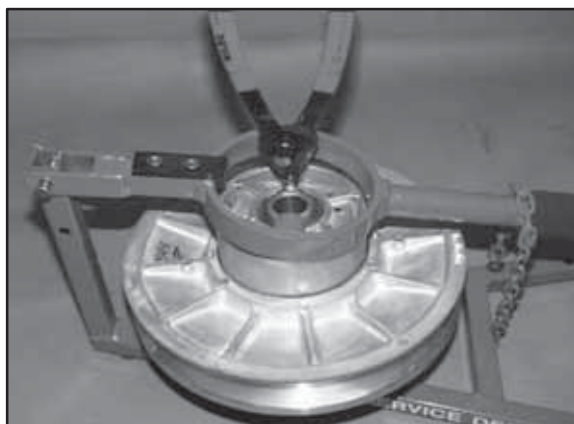
- When rotated clockwise, the outer sheave should lock to the shaft and inner sheave without slipping.



- Remove driven clutch from the transmission input shaft. Do not attempt disassembly of the driven clutch from the outside snap ring. The driven clutch must be disassembled from the helix side or the one-way clutch seals may be damaged.

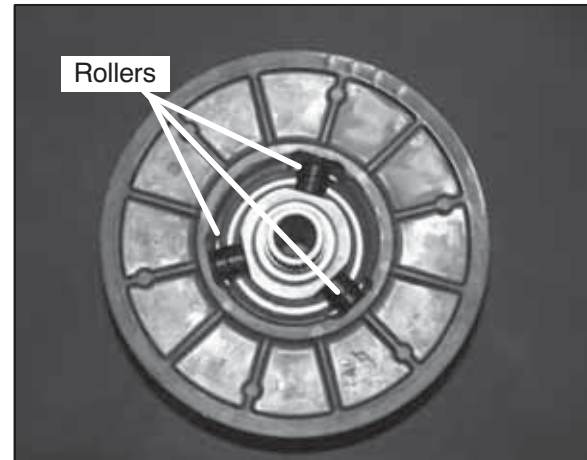


- Place the driven assembly into the clutch holder. Push helix inward. Remove snap ring, washer, helix, and spring. NOTE: The spring is a compression spring only and has no torsional wind.



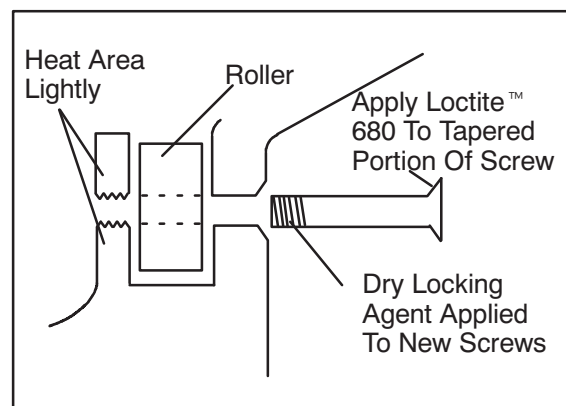
**NOTE:** Rotating the moveable sheave so that the rollers are not in contact with either helix ramp surfaces will lessen the effort needed to push the helix inward.

- Remove spring seat washer and inspect for wear or damage. Replace if worn.
- Inspect surface of rollers for flat spots and wear. Rollers must rotate freely on pins without excessive clearance. Check the roller pin and roller bore for wear and replace if necessary.



### ROLLER PIN DISASSEMBLY

New roller retaining bolts have a dry locking agent applied to the threads. Before attempting to remove the roller pins, heat the threaded area lightly with a propane torch. ***Wear heat resistant gloves during this procedure.*** Use a high quality hexagonal wrench in good condition to avoid screw damage. A small amount of valve grinding compound can be applied to the tip of the hex wrench to ensure a tight fit. Always use new bolts if they are removed for inspection. Apply Loctite™ 680 retaining compound sparingly to the tapered head portion of the roller retaining screws. Do not allow locking agent to contact the inside of the rollers. Do not lubricate the roller or roller pin.





## DRIVEN CLUTCH DISASSEMBLY/ INSPECTION CONT'D

7. Inspect moveable sheave bushing for wear. Inspect BOTH sheaves for signs of wear, grooving or cracking. Clean surfaces with a 3M™ pad if needed



### Moveable Sheave Bushing Inspection:

Replace the bushing if more brass than Teflon™ is visible on the surface of the bushing.

8. Check for movement of the shaft in the one-way clutch. If the shaft can be moved laterally, or if the one-way clutch does not function properly as described in Step 1 and 2 on Page 6.18, replace driven clutch assembly.



## EBS DRIVE BUSHING SERVICE

### EBS CLUTCH BUSHING REMOVAL AND INSTALLATION (Use Tool Kit PN 2201379)

The contents of this kit include:

| Item | Qty | Part Description         | Part No |
|------|-----|--------------------------|---------|
| A/B  | 1   | EBS Puller Tool          | 5132027 |
| C    | 1   | EBS Puller Nut           | 5132501 |
| D    | 1   | EBS Main Adapter         | 5132029 |
| E    | 1   | EBS Bushing Removal Tool | 5132028 |
|      | 1   | Instructions             | 9915111 |

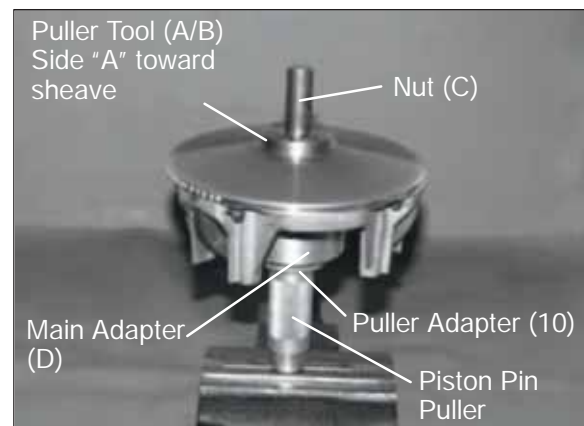
Also required: Clutch Bushing Replacement Tool Kit (PN 2871226) (ATV Clutch Kit) or (PN 2871025) (For all clutches) Piston Pin Puller (PN 2870386)

## REMOVAL AND INSTALLATION INSTRUCTIONS

NOTE: Bushings are installed at the factory using Loctite™ 609. In order to remove bushings it will be necessary to apply heat evenly to the area around each bushing. Clean all residual Loctite from bushing bore prior to installing new bushing.

### EBS Drive Clutch Moveable Sheave Bushing Removal

1. Remove clutch as outlined previously in this chapter.
2. Install handle end of Piston Pin Puller (PN 2870386) securely into bench vise and lightly grease puller threads.
3. Remove nut from puller rod and set aside.
4. Install puller adapter (Item 10 from kit PN 2871226).
5. Install main adapter (Item D) onto puller.



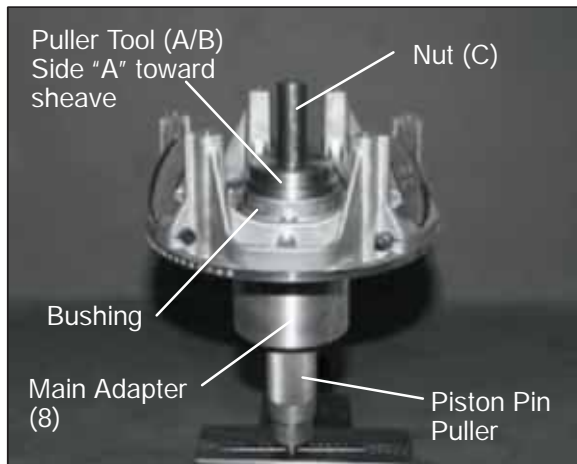




6. With towers pointing toward the vise, slide sheave onto puller rod.
7. Install removal tool (Item A/B) into center of sheave with "A side" toward sheave.
8. Install nut (C) onto end of puller rod and hand tighten. Turn puller barrel to increase tension on sheave if needed. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.
9. Turn sheave counterclockwise on puller rod until it comes free. Lift sheave off puller.
10. Remove nut from puller rod and set aside.
11. Pull bushing removal tool and adapter from puller rod. Remove bushing from tool and discard.

#### EBS Drive Moveable Bushing Installation

1. Place main adapter (Item 8) on puller.

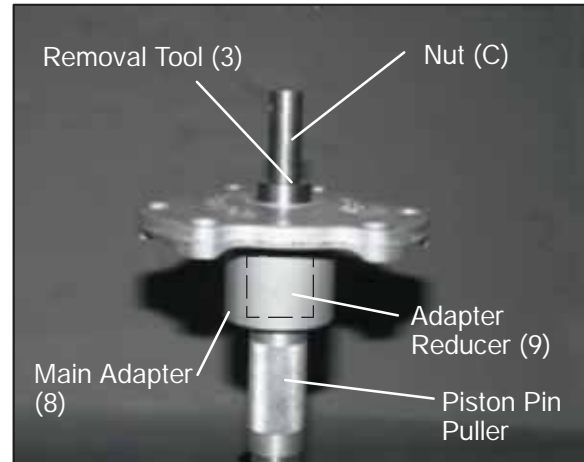


EBS Drive Clutch Moveable Sheave Bushing Installation

2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Set bushing in place on sheave.
4. Insert installation puller tool (Item A/B) with "A" side down, into center of bushing.
5. With towers pointing upward, slide sheave, bushing and tool onto puller rod.
6. Install nut on puller rod and hand tighten. Turn barrel to apply additional tension if needed.
7. Turn sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.
8. Remove nut from puller rod and set aside.
9. Remove sheave from puller.
10. Remove installation tool.

#### EBS Drive Clutch Cover Bushing Removal

1. Install main adapter (Item 8) on puller.



EBS Drive Clutch Cover Bushing Removal

2. Install adapter reducer (Item 9).
3. From outside of clutch cover, insert removal tool (Item 3) into cover bushing.
4. With inside of cover toward vise, slide cover onto puller.
5. Install nut onto puller rod and hand tighten. Turn puller barrel to increase tension as needed.
6. Turn clutch cover counterclockwise on puller rod until bushing is removed and cover comes free.
7. Remove nut from puller rod and set aside.
8. Remove bushing and bushing removal tool from puller. Discard bushing.

#### EBS Drive Clutch Cover Bushing Installation

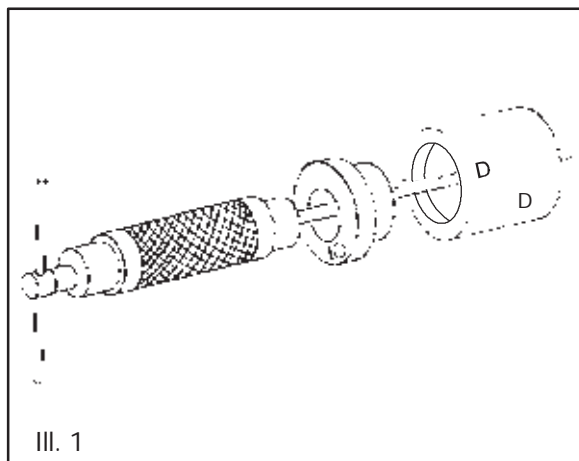
1. Apply Loctite™ 609 evenly to bushing bore in cover.
2. Working from inside of cover, insert new bushing and bushing installation tool into center of clutch cover.
3. With main adapter on puller, insert cover onto puller rod, placing outside of cover toward vise.
4. Install nut on rod and hand tighten. Turn puller barrel to apply more tension if needed.
5. Turn clutch cover counterclockwise on puller rod until bushing is seated.
6. Remove nut from puller rod. Take installation tool and clutch cover off rod.



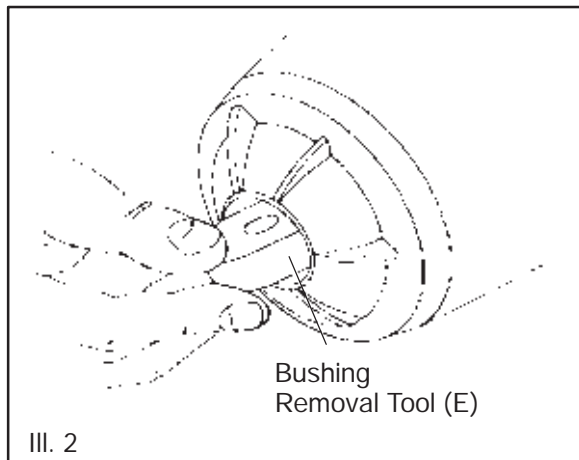
## EBS DRIVEN BUSHING SERVICE

### EBS Driven - Bushing Removal

1. Install puller adapter (Item 10) onto puller.



2. Insert EBS main adapter (Item D) onto puller. See III. 1.
3. Install bushing removal tool (Item E) into center of clutch sheave. See III. 2.



4. Install sheave onto puller.
5. Install left hand nut onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.
6. Using a hand held propane torch, apply heat evenly around outside of bushing until tiny smoke tailings appear.

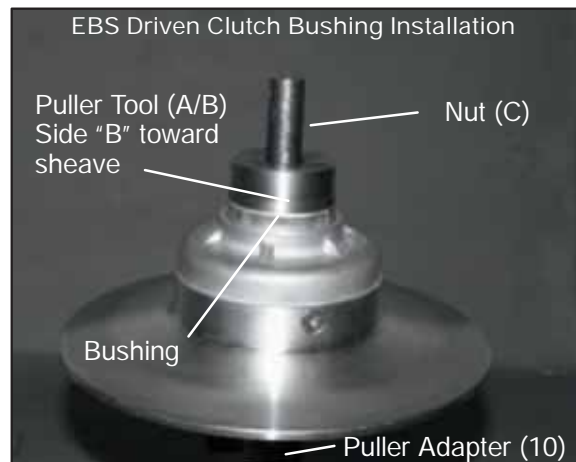
**CAUTION:** Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.

8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove adapters from puller.
10. Remove bushing and removal tool from adapters. Discard bushing.

### EBS Driven - Bushing Installation

1. Slide adapter (Item 10) onto puller.



2. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
3. Install sheave onto puller (belt surface up).
4. Place new bushing on side B of installation tool (Item A/B) and slide both over puller rod.
5. Install nut (C) onto puller rod and hand tighten against installation tool.
6. Turn clutch sheave counterclockwise until bushing is seated.
7. Remove nut (C) (left hand thread) from puller rod and set aside.
8. Remove installation tool and clutch sheave from puller.

### EBS Driven - Backside (Outer) Bushing Removal

1. Install main puller adapter (Item 8) onto puller.
2. Install adapter reducer (Item 9).
3. Using a hand held propane torch, apply heat around outside of bushing until tiny smoke tailings appear.

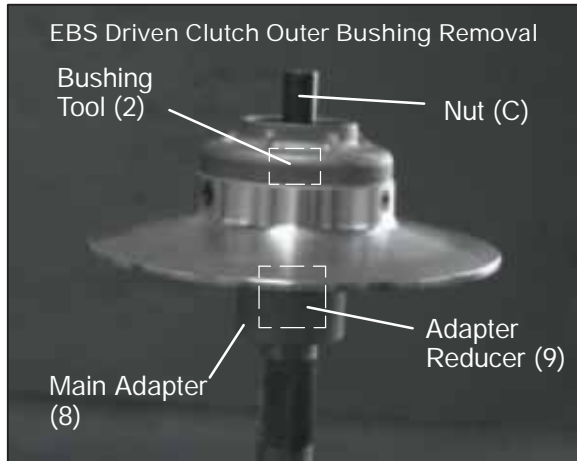
**CAUTION:** Clutch components will be hot! In order to avoid serious burns, wear insulated gloves during the removal process.

4. Flip sheave over onto puller.
5. Install bushing tool (Item 2).
6. Install left hand nut (C) and spacer onto puller rod and tighten by hand. Turn puller barrel for further tension if needed.





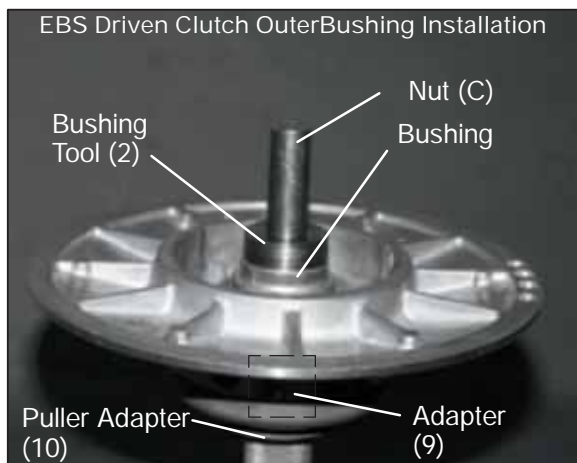
7. Turn clutch sheave counterclockwise until bushing is removed and sheave comes free.
8. Remove nut (C) (left hand thread) from puller rod and set aside.
9. Remove installation tool and clutch sheave from puller.



10. Remove bushing and removal tool from adapters. Discard bushing.

#### EBS Driven - Backside (Outer) Bushing Installation

1. Install puller adapter (Item 10) onto puller.
2. Install adapter (Item 9) onto puller.



3. Apply Loctite™ 609 evenly to bushing bore inside moveable sheave.
4. Install sheave face down on puller.
5. Install new bushing on installation tool (Item 2) and install assembly into sheave.
6. Install left hand thread nut (C) onto puller rod and hand tighten against installation tool.
7. Turn clutch sheave counterclockwise, making sure bushing is drawn straight into bore. Continue until bushing is seated.





## TROUBLESHOOTING

| Situation                                                                     | Probable Cause                                                                                                                                                                                                                                                                                           | Remedy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine RPM below specified operating range although engine is properly tuned. | <ul style="list-style-type: none"> <li>-Wrong or broken drive clutch spring.</li> <li>-Drive clutch shift weight too heavy.</li> <li>-Driven clutch spring broken or installed wrong .</li> </ul>                                                                                                        | <ul style="list-style-type: none"> <li>-Replace with recommended spring.</li> <li>-Install correct shift weight kit to match engine application.</li> <li>-Replace spring; refer to proper installation location.</li> </ul>                                                                                                                                                                                                                                                                                                                          |
| Erratic engine operating RPM during acceleration or load variations.          | <ul style="list-style-type: none"> <li>-Drive clutch binding.</li> <li>-Belt worn unevenly - thin/burnt spots</li> <li>-Driven clutch malfunction.</li> <li>-Sheave face grooved.</li> </ul>                                                                                                             | <ul style="list-style-type: none"> <li>a. Disassemble drive clutch; inspect shift weights for wear and free operation.</li> <li>b. Clean and polish stationary shaft hub; reassemble clutch without spring to determine problem area.</li> <li>Replace belt</li> <li>a. Replace ramp buttons.</li> <li>b. Inspect movable sheave for excessive bushing clearance/replace.</li> <li>-Replace the clutch.</li> </ul>                                                                                                                                    |
| Engine RPM above specified operating range.                                   | <ul style="list-style-type: none"> <li>-Incorrect drive clutch spring (too high spring rate).</li> <li>-Drive clutch shift weights incorrect for application (too light).</li> <li>-Drive clutch binding.</li> <li>-Driven clutch binding.</li> <li>-Converter sheaves greasy; belt slippage.</li> </ul> | <ul style="list-style-type: none"> <li>-Install correct recommended spring.</li> <li>-Install correct recommended shift weights.</li> <li>-Disassemble and clean clutch, inspecting shift weights and rollers. Reassemble without the spring and move sheaves through entire range to further determine probable cause.</li> <li>-Disassemble, clean, and inspect driven clutch, noting worn sheave bushing and ramp buttons and helix spring location.</li> <li>-Clean sheaves with denatured alcohol or brake cleaner, install new belt.</li> </ul> |
| Harsh drive clutch engagement.                                                | <ul style="list-style-type: none"> <li>-Drive belt worn too narrow.</li> <li>-Excessive belt/sheave clearance with new belt.</li> </ul>                                                                                                                                                                  | <ul style="list-style-type: none"> <li>-Replace belt.</li> <li>-Perform belt/sheave clearance adjustment with shim washers beneath spider.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 |
| Drive belt turns over                                                         | <ul style="list-style-type: none"> <li>-Wrong belt for application.</li> <li>-Clutch alignment out of spec.</li> <li>-Engine mount broken or loose.</li> </ul>                                                                                                                                           | <ul style="list-style-type: none"> <li>-Replace with correct belt.</li> <li>-Adjust alignment offset.</li> <li>-Inspect/adjust or replace.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                 |
| PVT cover overheating (melting)                                               | <ul style="list-style-type: none"> <li>-Plugged air intake or outlet</li> <li>-Belt slippage due to water, oil, grease, etc., rubbing on cover</li> <li>-Clutches or weight being applied to cover while in operation</li> <li>-Use of High vs. low range</li> </ul>                                     | <ul style="list-style-type: none"> <li>-Clear obstruction.</li> <li>-Inspect system. Clean , repair or replace as necessary. Seal PVT system ducts.</li> <li>-Remove weight. Inform operator.</li> <li>-Instruct operator on guidelines for operation in proper driving range for different terrain as outlined in Owner's Safety and Maintenance Manual.</li> </ul>                                                                                                                                                                                  |
| Water ingestion                                                               | <ul style="list-style-type: none"> <li>-Cover seals or ducts leaking</li> <li>-Operator error</li> </ul>                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>-Find leak and repair as necessary.</li> <li>-Instruct operator on guidelines for operation in wet terrain as outlined in Owner's Safety and Maintenance Manual.</li> </ul>                                                                                                                                                                                                                                                                                                                                    |





## TROUBLESHOOTING

| Situation                    | Probable Cause                                                                                                                                                                                | Remedy                                                                                                                                                                                                                                                  |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Belt slippage                | <ul style="list-style-type: none"><li>-Belt worn out</li><li>-Water ingestion</li><li>-Belt contaminated with oil or grease</li></ul>                                                         | <ul style="list-style-type: none"><li>-Replace belt.</li><li>-Inspect and seal PVT system.</li><li>-Inspect and clean.</li></ul>                                                                                                                        |
| Belt burnt, thin spots       | <ul style="list-style-type: none"><li>-Abuse (continued throttle application when vehicle is stationary, excess load)</li><li>-Dragging brake</li><li>-Slow, easy clutch engagement</li></ul> | <ul style="list-style-type: none"><li>-Caution operator to operate machine within guidelines.</li><li>-Vehicle operated with park brake on. Inspect brake system.</li><li>-Instruct firm, effective use of throttle for efficient engagement.</li></ul> |
| PVT noise                    | <ul style="list-style-type: none"><li>-Belt worn or separated, thin spots, loose belt</li><li>-Broken or worn clutch components, cover hitting clutches</li></ul>                             | <ul style="list-style-type: none"><li>-Replace belt.</li><li>-Inspect and repair as necessary.</li></ul>                                                                                                                                                |
| Engagement erratic or stabby | <ul style="list-style-type: none"><li>-Thin spots on belt, worn belt</li><li>-Drive clutch bushings stick</li></ul>                                                                           | <ul style="list-style-type: none"><li>-Replace belt. Refer to belt burnt troubleshooting and instruct operator.</li><li>-Inspect and repair clutches.</li></ul>                                                                                         |



